

WINTER CHILLER ALTERNATIVE PROJECT USING INTEGRATED PROJECT DELIVERY

This month's Facility File will focus on a new, highly efficient, air-cooled chiller to interface with the existing chiller plant at a mid-sized hospital in New England. The existing chilled water plant operates from spring through the fall, but this system is shutdown, as it was not engineered to operate 24/7 throughout the year.

During this heating season, the hospital struggles to provide adequate air conditioning to the operating rooms (ORs) and ancillary areas, e.g., recovery rooms, and this places a lot of demand on the facility operators to maintain adequate cooling in these areas using 100% outdoor air in lieu of mechanical cooling.

The hospital facility management developed a building program to add a 100-ton air-cooled chiller with propylene glycol and connected it to the chilled water supply and returns for the OR air conditioning (a/c) unit and a second a/c unit serving the OR support areas when the central plant is shutdown as well as to operate in an emergency electrical incident.

At the recommendation of the design team leader, the HVAC consulting engineer, the hospital's facility manager has chosen the project delivery method to be integrated project delivery (IPD). The method of project delivery is based on ASHRAE 2019 HVAC Applications Handbook, Chapter 59, "Integrated Building Design." This decision combined with the facility manager's own experience with managing capital projects has been approved as a necessity for this hospital located in New England and its unpredictable weather during the heating season.

An IPD team meeting was coordinated so that the facility manager, her owner representative consultant, the design team, the IPD project manager (HVAC design engineer), an infection control (IC) third-party consultant, a sound consultant, the general contractor, and subcontractors, along with a third-party commissioning and air and water balancing (CxTAB) consultant, can review the building program, establish a basis of design, and implement a new operation and maintenance (O&M) program for the central chilled water plant.

With the design guidelines noted above from ASHRAE, the IPD team discussed specific building standards that need to be applied to this project as well as the project's schedule/timeline. For the facility operation, with in-house staff and not an outsourced group, the staff will want to assure there is adequate contract specification requirements included pertaining to O&M, the training, the preventive maintenance work order system, and the energy operating budget.

In the Phase 3 Concept Development of the IPD project, the facility manager and a few of her O&M technicians will want to contribute information to the design team members' writing of the contract specification and, more specifically, service contracts, parts inventory, and as-built drawings requirements.

Based on the building program construction budget, the IPD estimator, along with the prime subcontractors, will be involved in the design phase and be able to contribute to the contract documents. In the construction phase, the O&M technicians will want to revisit the issues noted in the design phase. Integral to this early phase of the construction, the facility staff will use the design team's 3D building information modeling (BIM) and piping fabrication drawings to ensure that adequate access and personnel safety with the new air-cooled chiller, located approximately 6 feet from the roof's edge, will be available for the facility staff to safely perform their jobs.

Next comes the startup and commissioning phases, and the O&M staff will want to be proactive in following along with the IPD team's mechanical-electrical in-house coordinator and the subcontractor's startup personnel and receive equipment and system training using the O&M manuals and contract drawings (that will eventually become the as-built drawings). **ES**

Once the startup has been completed by the ATC subcontractor and owner representative, the CxTAB consultant will complete the water balancing of the new heating season chilled water systems. The IC consultant will commission and instruct O&M staff on IC policy and procedure. The HVAC subcontractor shall go through an automatic control system initial dry-run demonstration prior to the general contractor, and his subcontractors will demonstrate the system to the CxTAB consultant. The ATC subcontractor will also begin collecting system performance by trending pertinent HVAC system and equipment data including the following:

- Outdoor air dry bulb & wet bulb temperature
- Primary water system pressure
- Pressure differential across pumps and chiller
- Alarms
- Safeties
- Off-site internet computer control interface

Taking the same approach as the design engineers, the facility manager's personnel will use a series of computer-generated touchscreen project checklists that allows her staff to confirm that the following facility files have been collected. This process should start at the beginning of construction and not at project closeout so that the facility files can be inputted into a computerized maintenance management software (CMMS) system. Touchscreen O&M checklists should include:

- Equipment shop drawings
- O&M manuals, parts list, and lubricants
- Troubleshooting tips
- Remote monitoring instructions

The O&M staff should review the contractor-produced 3D BIM piping drawings for safety and accessibility field coordination drawings prior to fabrication and confirm:

- Access for air circulation around the chiller condenser fans
- Safety railings at edge of roof
- Access for servicing equipment

The IPD leader/HVAC design engineer along with the sound consultant will have taken sound readings that include:

- Initial outdoor ambient sound power levels during the day and during the night
- Post-construction outdoor ambient sound power levels during the day and night

The training process will include specific chilled water system and IC training but also emergency plan training due to unexpected alarm e.g., no flow alarm. The water balancing report will be completed, and the as-built conditions will be updated after the final TAB report. This will require the TAB subcontractor to provide the water balancing reports along with the associated system flow diagrams noting quantities and pressures for rebalancing, if necessary, as part of the sequence-by-sequence adjustments:

- existing chilled water flow
- winter chilled water flow
- emergency chilled water flow
- combined existing and new chilled water flow



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